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## Fumigate Firewood Infested with Mountain Pine Beetle

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Beetles in ponderosa pine firewood can be killed by spraying each cord with 2 gallons of ethylene dibromide emulsion then covering and sealing the piles with plastic.

**Keywords:** *Pinus ponderosa*, *Dendroctonus ponderosae*.

Mountain pine beetles are killing hundreds of thousands of ponderosa pines annually along the Front Range of the Rocky Mountains. In certain high-value areas, beetles are controlled by cutting infested trees and spraying them with ethylene dibromide (EDB) emulsion. Occasionally, infested trees are cut for firewood, but beetles can mature in this material, and it must be treated. Since firewood can be concentrated, it occurred to us that infested material might be more economically treated in stacks or piles rather than as logs. Also, covering piles with sheet plastic would likely increase the effectiveness of the EDB, which is a fumigant.

The objective of this study was to determine how much EDB is needed to kill beetles in fuelwood piles that are covered with sheet plastic after spraying.

A standard cord of fuelwood, 4 feet by 4 feet by 8 feet, can be made from about five trees similar in size to average Front Range infested ponderosa pines (utilizing the trees to a 4-inch top). If these trees were cut and sprayed individually, a total of about 25 gallons of 4.8 percent EDB emulsion would be needed to kill the beetles.

### Methods

We attempted to determine the minimum effective spray volume for treating a similar number of trees, but in piles. We sprayed three 1-cord piles with each of the following: 10, 5, or 2½ gallons of EDB per cord. Also, one pile was sprayed with 1¼ gallons per cord. Two piles received no treatment and one additional pile was covered with plastic but was not sprayed. The EDB was mixed with water to a standard concentration of 4.8 percent actual insecticide (based on labeled contents) and applied either June 17 or July 1, 1974. As soon as the spray was evenly applied, using low-pressure garden sprayers, clear 6-mil plastic was thrown over the pile and all edges covered with soil. Branches and log ends had been carefully trimmed to prevent tearing the plastic.

The piles were made by stacking three rows of 18-inch logs about 4 feet high and 7 feet long. The logs in each pile were then designated as being in one of three zones. Zone 1 logs were on top of the pile and along the upper 2 feet of the outside rows. Zone 2 logs were touching the ground. Zone 3 logs were in the middle of the middle row. The effectiveness of the treatments was then determined by periodically counting live and dead beetles from two 6-inch by 12-inch samples from each of two logs in each zone. The bark samples were taken from the top and bottom of each selected log. Piles that were sprayed with fumigant were not resampled once the plastic was removed. Check piles, un-

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sprayed and covered or not covered, were re-sampled at weekly intervals.

## Results and Discussion

All treatments resulted in complete beetle mortality (table 1).

Table 1.--Mountain pine beetle mortality in cordwood piles treated with ethylene dibromide (EDB) and in untreated (control) piles

Treatment	Mortality after--			
	8 days	15 days	22 days	29 days
- - - - Percent - - - -				
TREATED WITH EDB AND PLASTIC COVERED:				
10 gals/cord	100	100	100	--
5 gals/cord	100	100	100	--
2½ gals/cord	100	100	100	--
1½ gals/cord	--	100	--	--
UNTREATED (CONTROL):				
Plastic only	22	56	77	19
Open pile No. 1	8	11	2	11
Open pile No. 2 <sup>2</sup>	--	52	20	--

<sup>1</sup>Brood appeared to have been dead for several days.

<sup>2</sup>Broods in logs in this pile were so sparse they could not be sampled properly on all designated sample dates.

While complete brood mortality can evidently be obtained in early summer with EDB spray at 1¼ gallons per cord (128 cubic feet), 2 gallons give better spray distribution throughout the pile, and the added cost of material and time to apply is insignificant.

Mortality in the control piles is further broken down by zones within the poles. Due to the limited sampling for each period, this mortality for all dates has been averaged. Mountain

pine beetle mortality averaged by zones within the untreated piles was as follows:

	Plastic covered (Percent mortality)	Control (not covered)
Zone 1		
Top of log	100	52
Bottom of log	84	21
Zone 2		
Top of log	53	20
Bottom of log	21	9
Zone 3		
Top of log	51	23
Bottom of log	24	7

Mortality under plastic is considerably greater than shown here. Beetles that emerge from Zones 2 and 3 die in great numbers under the plastic on sunny sides of the piles. Such mortality is very difficult to measure and no estimate is available.

Ethylene dibromide is a fumigant which soon volatilizes, leaving an inconsequential residue on the firewood.

Spraying and covering cordwood piles for mountain pine beetle control costs about as much as the more conventional cut and spray technique, but the amount of EDB saved is certainly an attractive feature of the method described here.

It is also important that the stack, spray, and seal method eliminates two of the most common causes for control ineffectiveness using the individual tree spraying method. With the fumigation method, it is not necessary to insure complete coverage of each inch of the infested material, and it is not necessary to re-treat infested material if it rains shortly after the treatment is completed.

Tests similar to these described here were made in late 1974 to determine the effectiveness of this treatment with an oil carrier applied during the winter months. No satisfactory mortality was obtained after 4 weeks.

Although this report discusses research involving pesticides, such research does not imply that the pesticide has been registered or recommended for the use studied. Registration is necessary before any pesticide can be recommended. If not handled or applied properly, pesticides can be injurious to humans, domestic animals, desirable plants, fish, and wildlife. Always read and follow the directions on the pesticide container.

